

REMARKS

Applicants acknowledge the allowability of the subject matter of Claims 38-43, as set forth in item 8 on page 5 of the Office Action. In particular, the latter claims would be allowable if rewritten in independent form. Nevertheless, as discussed hereinafter, Applicants respectfully submit that Claims 38-43 are allowable in their present dependent form. (Applicants note in this regard that the dependency of Claims 39-43 has been amended.)

In response to the objection to the specification as set forth in items 2 and 3 on page 2 of the Office Action and the objection to Claim 30 as set forth in item 4 of the Office Action, Applicants have amended the specification and the text of Claim 30 in the manner suggested by the Examiner. Accordingly, reconsideration and withdrawal of these grounds of objection are respectfully requested.

Claims 23-37 and 44 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Urai et al (U.S. Patent No. 6,021,375) in view of Iizuka et al (U.S. Patent No. 5,278,764). However, despite the mention of Iizuka et al in the first paragraph of item 7 on page 3 of the Office Action, the balance of item 7 refers specifically to Ito et al - U.S. Patent No. 4,048,613 – which was cited in the Information Disclosure Statement. Moreover, a comparison of the comments in item 7 of the Office Action with the text and drawings in both Iizuka et al and Ito et al suggests that the Examiner intended to rely on Ito et al, and that the

reference to Iizuka et al in the first paragraph of item 7 was an oversight. Accordingly, the remainder of the discussion herein is based on this premise. If in fact, the Examiner intended to rely on Iizuka et al, further explanation is respectfully requested.

The present invention is directed to a method and apparatus for triggering automatic emergency braking in a first vehicle, in order to avoid or mitigate the effect of a rear end collision with a second vehicle which is traveling ahead of the first vehicle, by implementing a predefined emergency braking deceleration. According to the invention, an instantaneous driving situation of the first vehicle is determined based on a registered acceleration of the first vehicle, and taking into account also a detected current relative acceleration between the first and second vehicles. A driver warning is then triggered if at least one predefined warning condition is fulfilled; and automatic emergency braking is then triggered after the driver warning.

Independent Claims 23 and 44 further specify that fulfillment of the warning condition requires that, based on the predefined emergency braking deceleration, and on the instantaneous situation of the first vehicle (which was determined based on a detected acceleration of the first vehicle, as well as relative acceleration between the vehicles) emergency braking is to be triggered, causing the vehicle to decelerate with the predefined emergency braking deceleration. In addition, Claims 23 and 44 further specify that the warning

condition includes a predefined target safety distance and a predefined target relative speed, both of which are to be attained after completion of the automatic emergency braking process, including the predefined emergency braking deceleration.

Finally, Claims 23 and 44 further specify that the automatic emergency braking process is delayed until expiration of a predefined warning time period after the driver warning has been triggered.

The Urai et al reference discloses a system for controlling running safety of a vehicle by implementing an automatic braking operation independently of a vehicle operator control, when the vehicle reaches a calculated distance L_b at which its distance to the vehicle ahead is the minimum necessary to avoid contact by operating the braking system 22. (See Column 5, lines 33-35.) In order to avoid unnecessary interference with the steering of the vehicle by the vehicle operator (Abstract, lines 15-18), Urai et al provides an additional threshold distance determination of a distance L_s , being the minimum distance necessary to avoid contact with the vehicle traveling ahead by steering to the left or right. (See Column 2, lines 30-47.)

The minimum avoidance distances L_s (for steering avoidance) and L_b (for braking avoidance) are calculated in a manner described in the specification at Column 5. (Accordingly, they do not constitute predefined target safety distances, as recited in Claims 23 and 44.) As illustrated in Figure 2, the

calculated L_s and L_b values are then used, together with a determined distance to the vehicle ahead, “for determining a deceleration of the vehicle to be generated based on a result of the determination of the second obstacle avoidance possibility determining means and for operating the brake actuating means based on the determined deceleration....” (Column 2, lines 40-44.)

Urai et al differs from the present invention as defined in Claims 23 and 44 in at least the following respects: First, it does not teach or suggest a collision avoidance system which “implement[s] a predefined emergency braking deceleration”, based on a determined instantaneous driving situation of the vehicle, which itself is based on a registered acceleration of the vehicle, and based also on the registered current relative acceleration between the first and second vehicles, as recited in both Claims 23 and 44. Moreover, it is also does not provide a system in which fulfillment of a warning condition requires that an automatic emergency braking process...is to be triggered, based on predefined target safety distance and relative speed values.

With regard to these limitations, item 7 of the Office Action at page 3 indicates that Urai et al utilizes a predefined emergency braking deceleration, referring in particular to the respective deceleration values 0.2G, 0.4G, etc. Applicants respectfully submit, however, that Urai et al does not in fact implement or take into account a “predefined emergency braking deceleration”, as recited in Claims 23 and 44. Rather, as noted at Column 2, lines 40-44, the

driving situation is used to determine the emergency braking value that will be used to decelerate the vehicle (0.2G, 0.4G, etc.). (See, for example, the discussion at Column 7, lines 4-34.) In this regard, the embodiment of Figure 6 is simply a more elaborate version of the embodiment of Figure 2, which includes four possible levels of braking as opposed to two in Figure 2. The principle is the same, however, in that the distances L_s , L_{b1} , L_{b2} and L_b are used to determine the braking value that is to be implemented.

Urai et al also does not provide a system in which a predefined target safety distance and a predefined target relative speed are used as criteria for fulfillment of a warning condition. Rather, in Urai et al, as illustrated in blocks S14 and S18 in Figure 2, and blocks S102, S104, S108, S112 and S116 in Figure 6, the determination of a braking value is based on a comparison of the distance X (between the vehicle and the vehicle traveling in front of it) with calculated values for L_s and L_b , as indicated at Column 5, lines 25-30 and 61, and Column 7, lines 26-28. Since the latter are calculated (Fig. 6, step S102), Urai et al does not disclose a predefined target safety distance, and accordingly even if a target relative speed would be dependent upon the distance L_s , as suggested in the Office Action, the target speed itself is not predefined, but rather is calculated.

The Ito et al reference, on the other hand, has been cited as teaching an automatic braking apparatus in which the automatic brake operation is triggered following expiration of a predefined time period after the driver

warning has been triggered. Applicants respectfully submit that it neither teaches nor suggests a modification of the Urai et al reference, which would replicate the present invention, including the features described above.

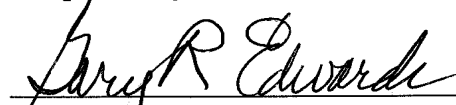
In this regard, Applicants note that in Urai et al, triggering of automatic braking is based entirely on a comparison of the remaining distance R between the first vehicle and the vehicle traveling ahead, with calculated values for the minimum distance necessary for collision avoidance by steering, and the minimum distance for collision avoidance by braking. Neither the detected acceleration of the first vehicle, nor the relative acceleration between the first vehicle and the vehicle traveling ahead is taken into account in this determination, as recited in the first and penultimate paragraphs in the body of Claims 23 and 44. Ito et al, on the other hand, does not disclose a system which includes a step of determining an instantaneous driving situation of the first vehicle "based on a registered acceleration of the first vehicle, and taking into account said emergency braking deceleration", and further taking into account "relative acceleration between the first and second vehicles". While different deceleration values β_1 and β_2 are taken into account in calculating the value which is compared with the remaining distance between the vehicles in the comparators 24 and 25, the system in Ito et al takes into consideration neither the acceleration of the first vehicle nor the relative acceleration of both vehicles, as recited in the claims. Moreover, in view of the differences recited previously, a combination of Ito et al with Urai et al, if the same is possible, would not result

in the present invention in which, in addition to the predefined emergency braking deceleration, both the determined acceleration of the first vehicle and the relative acceleration of the first and second vehicles is taken into account.

In light of the foregoing remarks, this application should be in consideration for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #095309.56052US).

Respectfully submitted,



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